Math 212
Quiz 01

M 22 Aug 2016

Your name: _____

Honor pledge:

Exam instructions

Number of exercises : 12
Permitted time : 30 minutes
Permitted resources : None

Instructor's note:

- BEFORE SOLVING any exercises, go through the entire quiz and write a "confidence number" 1–5 to the LEFT of each exercise, denoting how confident you are that you can solve the exercise (1 = "Not at all confident", 5 = "Very confident").

1.1	/2	2.1	/2	3.1	/2
1.2	/2	2.2	/2	3.2	/2
1.3	/2	2.3	/2	3.3	/2
1.4	/2	2.4	/2	3.4	/2
Total	/8		/8		/8

Geometry

1.1 Exercise 1.1

(2 pt) Compute the distance between the points $(-2,-1)$ and $(4,7)$ in $\mathbf{R}^2$.

1.2 Exercise 1.2

(2 pt) Write the area of a circular sector with radius r and angle θ, where $0 \leqslant \theta \leqslant 2\pi$.

1.3 Exercise 1.3

(2 pt) Write the area of a parallelogram with adjacent side lengths u, v and enclosed angle θ.

1.4 Exercise 1.4

(2 pt) Convert the point $(4, \frac{7\pi}{6})$, given in polar coordinates (r, θ), to rectangular coordinates (x, y).

Single-Variable Calculus

2.1 Exercise 2.1

(2 pt) Evaluate the integral $\int \cos^2 \theta \, d\theta$.

2.2 Exercise 2.2

(2 pt) Evaluate the integral $\int \sqrt{2x+1} \, dx$.

2.3 Exercise 2.3

(2 pt) Let f be a real-valued function defined on the closed interval $[a, b]$, and let f' be continuous on $[a, b]$. State the length of the curve $f(x)$ from $x = a$ to $x = b$.

2.4 Exercise 2.4

(2 pt) Let f be a real-valued function defined on a closed interval $[a, b]$ with $a < b$. Draw a picture depicting a Riemann sum corresponding to the definite integral

$$\int_a^b f(x)dx.$$

Vector Calculus

3.1 Exercise 3.1

(2 pt) Let $\mathbf{u} := (2, 0, 1)$ and $\mathbf{v} := (0, -1, 1)$ be vectors in $\mathbf{R}^3$.

(a) (1 pt) Compute the inner product (a.k.a. dot product) $\mathbf{u} \cdot \mathbf{v}$.

(b) (1 pt) Compute the cross product $\mathbf{u} \times \mathbf{v}$.

3.2 Exercise 3.2

(2 pt) Find the absolute maximum and minimum values of the function

$$f(x, y) := x^2 - 2xy + 2y$$

on the closed rectangle

$$D := \{(x, y) \mid 0 \leqslant x \leqslant 3, 0 \leqslant y \leqslant 2\}.$$

3.3 Exercise 3.3

(2 pt) Evaluate the integral

$$\iint_R e^{\frac{x+y}{x-y}} dA,$$

where R is the trapezoidal region in $\mathbf{R}^2$ with vertices $(1,0), (2,0), (0,-2), (0,-1)$.

3.4 Exercise 3.4

(2 pt) Evaluate

$$\iint_S \mathbf{F} \cdot d\mathbf{S},$$

where

$$\mathbf{F}(x, y, z) := \left(xy, y^2 + e^{xz^2}, \sin(xy)\right),$$

and S is the surface of the region E bounded by the parabolic cylinder $z = 1 - x^2$ and the planes $z = 0$, $y = 0$, and $y + z = 2$.